

Analysis of research funding in Endodontics presented at the annual meetings of the Brazilian Society of Dental Research: bibliometric review

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Abstract The aim of this study was to conduct a bibliometric analysis of the scientific production in Endodontics presented at the annual meetings of the Brazilian Society of Dental Research (SBPqO) evaluating its main sources of funding. A retrospective observational study was carried out analyzing abstracts published in the SBPqO proceedings in all categories, over a period of 10 years (2011 to 2021). For data collection, the keywords "Endodontics," "root canal," "endodontic treatment," "apical foramen," and "dental pulp" were used. Data extraction was performed by two independent reviewers who identified 2534 abstracts. Regarding the distribution of funding, it was observed that 33.93% (n=860) of the studies were funded. Among the funding agencies, the Coordination for the Improvement of Higher Education Personnel (Capes) (n=211; 24.53%) and the National Council for Scientific and Technological Development (CNPq) (n=163; 18.95%) were the ones that provided the most funding, both being national funding institutions. When analyzing the geographical distribution of funding, the Southeast region accounted for 72.45% (n=270), with the state of São Paulo receiving the most support (56.68%, n=211). The North region received the lowest amount of funding. In the proportional analysis (number of funded studies and the presence of Postgraduate Programs in Dentistry by region), the Southeast presented 3.87 fundings per program. throughout the evaluated decade, research in the field of Endodontics presented at SBPqO increased until 2018 and then decreased. Most of the research focused on the thematic area of endodontic materials.

Descriptors: Endodontics. Research Financing. Education, Dental, Graduate.

Análisis de financiamiento para investigaciones en Endodoncia presentado en las reuniones anuales de la Sociedad Brasileña de Investigaciones Dentales: revisión bibliométrica

Resumen El objetivo de este estudio fue realizar un análisis bibliométrico de la producción científica en Endodoncia presentada en las reuniones anuales de la Sociedad Brasileña de Investigación Dental (SBPqO), evaluando sus principales fuentes de financiación. Se realizó un estudio observacional retrospectivo analizando los resúmenes publicados en los anales de la SBPqO durante un período de 10 años (2011 a 2021), en todas las categorías. Para la recolección de datos se utilizaron las palabras clave "Endodoncia", "endodoncia", "tratamiento endodóntico", "foramen apical" y "pulpa dental". La extracción de datos fue realizada por dos evaluadores independientes, que identificaron 2534 resúmenes. En cuanto a la distribución del financiamiento, se pudo observar que el 33,93% (n=860) de los estudios fueron financiados. Entre las entidades financiadoras que aportaron mayor financiamiento se encuentran la Coordinación de Perfeccionamiento del Personal de Educación Superior (CAPES) (n=211; 24,53%) y el Consejo Nacional de Desarrollo Científico y Tecnológico (CNPq) (n=163; 18,95%), que son instituciones financieras nacionales. Al analizar la distribución geográfica del financiamiento, se observó que el Sudeste poseía el 72,45% (n=270), siendo el estado de São Paulo el que recibió más incentivos (56,68%, n=211). La región Norte recibió el menor número de financiamiento. En el análisis proporcional (número de trabajos financiados y presencia de Programas de Postgrado en Odontología por región), el Sudeste presentó 3,87 financiamientos por programa. Durante la década evaluada, las investigaciones en el área de Endodoncia presentadas en la SBPqO aumentaron hasta

2018 y luego disminuyeron. La mayoría de las investigaciones se han centrado en el área temática de los materiales endodónticos.

Descritores: Endodoncia. Financiación de la Investigación. Educación de Posgrado en Odontología.

Análise do financiamento de pesquisas em Endodontia apresentadas nas reuniões anuais da Sociedade Brasileira de Pesquisa Odontológica: revisão bibliométrica

Resumo O objetivo deste estudo foi realizar uma análise bibliométrica da produção científica em Endodontia apresentada nas reuniões anuais da Sociedade Brasileira de Pesquisa Odontológica (SBPqO), avaliando suas principais fontes de financiamento. Foi realizado um estudo observacional retrospectivo analisando os resumos publicados nos anais da SBPqO em um período de 10 anos (2011 a 2021), em todas as categorias. Para a coleta de dados foram utilizadas as palavras-chave "Endodontia", "canal radicular", "tratamento endodôntico", "forame apical" e "polpa dental". A extração dos dados foi realizada por dois avaliadores independentes, que identificaram 2534 resumos. Com relação à distribuição de financiamento, foi possível observar que 33,93 % (n=860) dos estudos foram financiados. Dentre as agências de fomento que mais financiaram foram a Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) (n=211; 24,53%) e o Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) (n=163; 18,95%), que são instituições de financiamento nacionais. Ao analisar a distribuição geográfica dos financiamentos observou-se que o Sudeste deteve 72,45% (n=270), sendo o estado de São Paulo o que mais recebeu incentivo (56,68%, n=211). A região Norte foi a que recebeu menor número de financiamentos. Na análise proporcional (quantidade de trabalhos financiados e presença de Programas de Pós-graduação em Odontologia por região), o Sudeste apresentou 3,87 financiamentos por programa. Durante a década avaliada, as pesquisas na área de Endodontia apresentadas na SBPqO aumentaram até 2018 e, em seguida, decresceram. A maioria das pesquisas se concentrou na área temática de materiais endodônticos.

Descritores: Endodontia. Financiamento da Pesquisa. Educação de Pós-Graduação em Odontologia.

INTRODUCTION

Scientific research in the field of Endodontics encompasses a wide variety of topics - clinical, biological, microbiological, and materials - aiming to enhance diagnosis and understand health-disease processes, facilitating the management of endodontic lesions^{1,2}.

Investment in scientific research in healthcare amounts to \$476.5 billion annually in developed countries like the United States³. Currently, with the aid of research, significant advances in the field are being achieved. Research has become an extremely important tool for acquiring the knowledge necessary to solve problems and situations in general. New technologies, materials, and techniques are emerging with the goal of improving new procedures and treatments, such as photodynamic therapy⁴, nanotechnology in Endodontics⁵, regenerative dentistry⁶, and three-dimensional (3D) printing⁷, which have only been made possible thanks to scientific foundations.

Brazilian dentistry has achieved a prominent position on the international stage. Brazil is the second country with the most articles published in 2023 in the field of Dentistry according to the SCImago Journal & Country Rank. Despite the country being the seventh largest H-index, with relatively low citations, this significant advancement has brought great opportunities and visibility to researchers in the field^{1,2,8,9}. The way this knowledge is built and disseminated is of utmost importance, as it will serve as a foundation to guide and instruct thoughts across all areas of Dentistry. In Brazil, the field of Endodontics is always in the spotlight due to the quantity of research, as evidenced by the number of papers presented at the Annual Meeting of the Brazilian Society for Dental Research (SBPqO). From 2010 to 2018, Endodontics accounted for a percentage of abstracts ranging from 10.8% to 13.4% of the total abstracts presented at the event³.

The Brazilian Society for Dental Research (SBPqO) has been hosting an annual event since 1983 and is characterized as a non-profit association. It constitutes the largest division in Latin America of the International Association for Dental Research (IADR). It is considered the largest national dental research event and the most important in the country, bringing together publications from across the country and Latin America in its meetings. Of the papers presented in the last decade, 13.4% were related to Endodontics³, an internationally prominent field, with specific highly regarded journals such as the International Endodontic Journal and the Journal of Endodontics, which consistently publish research with speed and agility in information dissemination^{2,3,10-12}.

Regarding Endodontics, despite the considerable presence of published works over the years in SBPqO meetings³, little is known about research funding in this area in Brazil. Therefore, the present study aims to conduct a bibliometric analysis of the scientific production in Endodontics presented at the annual meetings of SBPqO regarding research funding, geographic region, year of presentation, type of sample analyzed, and the most studied topics.

METHOD

A retrospective observational study was conducted by analyzing the abstracts published in the proceedings of SBPqO over a 10-year period (2011 to 2021; with the exception of 2012, when IADR took place in Brazil, and there was no SBPqO meeting), across all available categories in the proceedings published on the official website of the organization.

A standardized search was conducted using terms selected based on theoretical relevance, comprehensiveness, specificity, and relevant synonyms to ensure that the search includes key works related to our research topic, including "Endodontics," "root canal," "endodontic treatment," "apical foramen," and "dental pulp." These descriptors were used in both Portuguese and English. Data extraction was performed by two researchers (JCCJ and AVPV) who were previously calibrated ($\kappa = 0.88$). In case of doubts, a third evaluator (BRV) was consulted. All presentation categories were included. In the category of reviews, abstracts that did not deal with systematic reviews were excluded, as they are not eligible for funding. Furthermore, to standardize data collection and evaluation procedures, the abstracts were assessed for the presence of descriptors in the title, keywords, or the abstract text.

Since the annual meeting of SBPqO is a multidisciplinary congress, it is common for studies to involve different areas of Dentistry. Therefore, the specialties were grouped according to the criteria of Gabardo et al. (2019)³, considering the proximity of subjects. For the analysis of the abstracts, in addition to sorting them by year of publication, attention was paid to studies that were funded (according to the funding institution mentioned in the abstract), the thematic area, geographic region of origin (institution of origin), and the type of sample analyzed. The data were organized and analyzed using descriptive statistics and graphs.

RESULTS

In total, 2534 abstracts related to Endodontics were identified. The highest number of works were published in 2018, totaling 331 articles (13.06%), followed by the years 2016 ($n = 318$; 12.54%) and 2015 ($n = 300$; 11.83%). The quantity of studies from the other years is presented in Figure 1.

When assessing the categorization by thematic area, organized into major areas according to Gabardo et al. (2019)³, it is observed that the theme "endodontic materials" had the highest percentage ($n=746$; 29.43%), followed by "endodontic instruments" ($n=426$; 16.81%) and "endodontic techniques" ($n=421$; 16.61%). The quantity of studies in the other thematic areas is displayed in Figure 2.

Regarding the distribution based on research funding information provided by the authors, it was possible to observe that the number of funded studies was 33.93% ($n=860$). Among the funding agencies, the Coordination for the Advancement of Higher Education Personnel (Capes) ($n=211$; 24.53%), the National Council for Scientific and Technological Development (CNPq) ($n=163$; 18.95%), and the São Paulo Research Foundation (FAPESP) ($n=113$, 13.13%) stand out. Other funding sources came from regional, state, or private institutions.

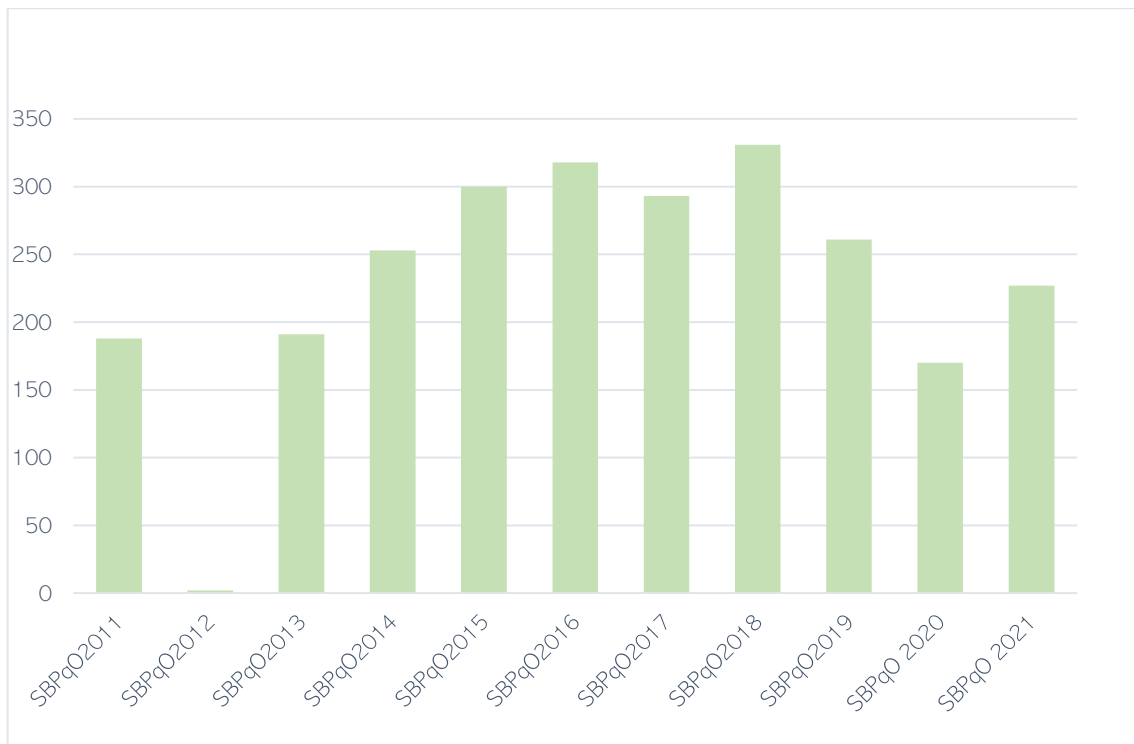


Figure 1. Quantitativo das produções em Endodontia na SBPqO entre os anos de 2011 e 2021.

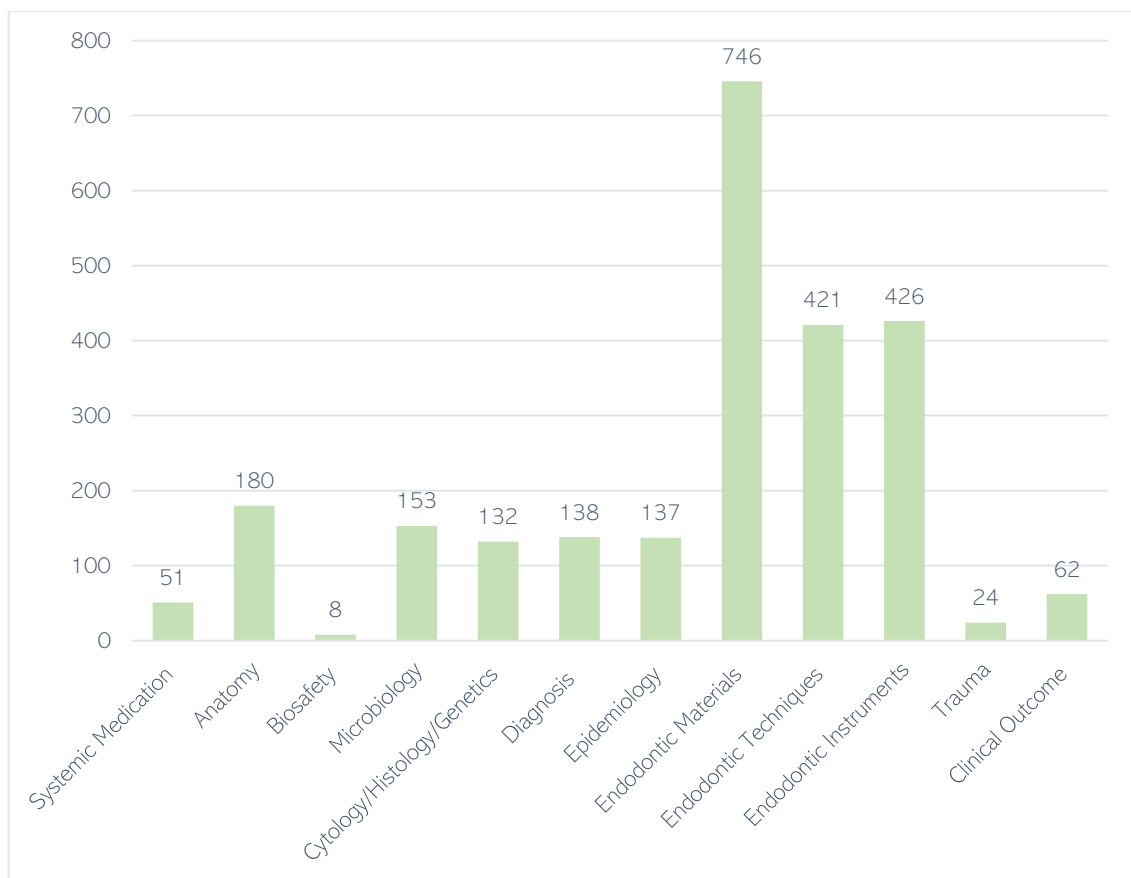


Figure 2. Most prevalent study categories in Endodontics at SBPqO between the years 2011 and 2021.

Capes and CNPq are national funding institutions and accounted for 43.48% (n= 374) of the assessed funding. However, when analyzing the geographical distribution of the funding (Figure 3), it was observed that the Southeast region of the country held 72.45% (n=270) of all funding between the years 2011 and 2021, with the state of São Paulo receiving the most support (56.68%, n=211). Four states in the country (Acre, Rondônia, Roraima, and Alagoas) did not receive any form of funding (national, regional, or state level).

By using proportion analysis, which consists on dividing the number of funded works by the number of postgraduate dentistry programs according to Capes for the 2017-2019 triennium in each region of Brazil, the following proportions were identified: Southeast with 3.871 (271/70); South with 1.563 (50/32); Northeast with 1.167 (28/24); Central-West with 1.125 (18/16) and finally, the Northern region with 0.612 (7/8).

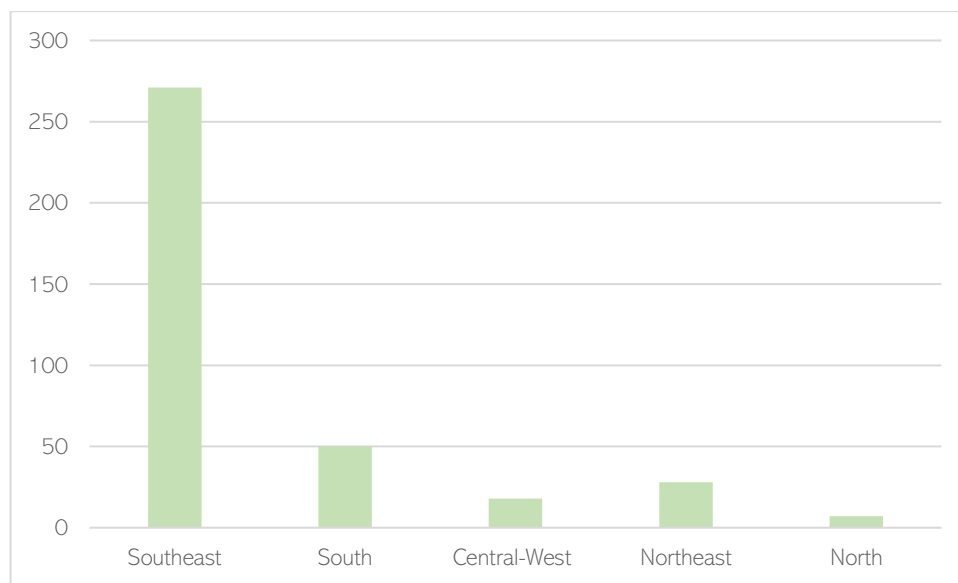


Figure 3. Geographical distribution of research funding in Endodontics from CAPES and CNPq at SBPqO between the years 2011 and 2021.

DISCUSSION

Among the evaluated categories, endodontic materials thematic predominated in the studies published in the event's proceedings. In recent years, there has been an increase in research related to new technologies, associated with the revolution of methods and techniques for root canal treatment. Included in the developments, which deserve special mention, are mineral trioxide aggregate (MTA) and bioceramic cements, considered advancements in endodontic materials. The main reasons for significant advances in research related to endodontic materials were the need to reduce failures and treatment time while increasing the likelihood of success¹³.

A study conducted by Costa et al. (2021)¹² evaluated the abstracts of studies presented at SBPqO on the use of computerized microtomography (micro-CT) in various dental fields between 2009 and 2018. The results showed that Endodontics was the specialty that utilized this research method the most, with a total of 122 studies (35%).

Gabardo et al. (2019)³ also analyzed research in Endodontics presented between 2010 and 2018 at SBPqO events, obtaining a total of 2516 abstracts, a number lower than the data presented in the current study. This fact demonstrates the growth of the Endodontics field at the event. Both studies obtained similar results regarding the most studied category and the geographic region with the highest number of abstracts. It's worth noting that the present study differentiated itself by including information about the funding of the presented research.

Research funding in Brazil is provided through various systems and funding institutions, which are directly or indirectly linked to ministries (education, science, and technology). Institutional funding, for example, is derived from the National Fund for Scientific and Technological Development (FNDCT)¹⁴. Certain public universities also have their own agencies, foundations, and separate funds that are managed to support their faculty and students in research and development of technological innovations. There is also, to a lesser extent, funding from the private sector, coming from companies and the industrial sector.

In Brazil, private investments in research represent only 0.55% of the Gross Domestic Product (GDP), whereas South Korea invests 2.68%, and China invests 1.22%. Regarding public funding, Brazil (0.61% of GDP) is close to the percentage (0.69%) of countries that are members of the Organization for Economic Cooperation and Development (OECD), which consists of 34 countries considered developed, excluding Chile, Mexico, and Turkey¹⁴.

Brazilian research and scientific publications are primarily funded by state and federal public entities, with scholarships being the primary forms of financing used¹⁵. In the results presented, the Southeast region received the most national funding for its work, with the state of São Paulo surpassing all others. The region demonstrates a significant investment in research due to the high concentration of state and federal higher education institutions, which play a crucial role in the country's scientific production¹⁵. Another factor that helps explain this is the number of postgraduate courses in Dentistry in the region, according to the Coordination for the Improvement of Higher Education Personnel (Capes), which is responsible for evaluating postgraduate programs in Brazil. In the 2017-2019 triennium, the Southeast region had 70 postgraduate programs in Dentistry, while the South had 32, the Northeast had 24, the Central-West had 16, and the North had 8.

On the other hand, four states located in the North and Northeast regions did not receive any funding, namely Acre, Rondônia, Roraima, and Alagoas, highlighting the existing disparities in access to research resources¹⁵.

This fact is supported by the study by Almeida and da Costa (2023)¹⁶, indicating that budgetary constraints significantly affected the activities of the funding institution, leading to scholarship cuts and a reduction in the number of supported postgraduate programs. Additionally, the report highlights a decrease in participation in scientific events and the publication of scientific articles. The report also emphasizes that budgetary constraints negatively impacted the quality of research in Brazil, as the reduction of resources limits the researchers' ability to carry out their research and produce meaningful results¹².

Since this study only evaluated published abstracts, one limitation is the inability to collect all the information from some of the included research, such as funding data not expressed in the abstract. Another limitation of the study is the inclusion of only Endodontics studies, and further research is necessary to determine if the funding distribution pattern remains consistent across all specialties.

The proportion data allowed for the observation that the Southeast region stands out in obtaining funding regarding the number of postgraduate courses in Dentistry, followed by the South region. Meanwhile, the Northeast and Central-West regions present similar proportions, and the North region has the lowest proportion of funding in relation to the number of postgraduate courses. It's worth noting that the analysis of proportion may have limitations, as there are other important variables to consider when assessing investment in education and research in each region. Therefore, this study contributes to Brazilian science as a warning of the need for the decentralization of research investment from a single region of the country and the need for funding policies for specific regions.

CONCLUSION

During the evaluated decade, research in the field of Endodontics presented at SBPqO increased until 2018 and then decreased. Most of the research focused on the thematic area of endodontic materials. The Southeast region had the highest proportion of funding in relation to the number of programs, while the North had the lowest. It is clear that there is a need for an equitable distribution of resources to promote the development of knowledge across the entire country.

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